High Voltage Products

Live Tank Breakers
Hitachi Energy covers the entire portfolio of Air-Insulated Switchgear (AIS) and Gas-Insulated Switchgears (GIS). AIS primary equipment includes Live Tank Breaker (LTB), Dead Tank Breakers (DTB) as well as instrument transformers, disconnectors and surge arresters. Hitachi Energy pioneered high-voltage Live Tank Breakers (LTB) and it is now a global leader, offering a full-range of products with voltage levels from 72.5 kV up to 1100 kV matching current and future requirements of modern grids. Hitachi Energy focuses on the continuous development of new technologies to increase the eco-efficiency, availability and reliability of AIS substations products.

More than a century in circuit breaker technology

Hitachi Energy is a pioneering technology leader that works closely with utility, industry, transportation and infrastructure customers to improve their performance while lowering environmental impact. Hitachi Energy operates in more than 80 countries.

Many first's from Hitachi Energy in LTB

- 1952: First 420 kV breaker
- 1954: By Pass switches
- 1965: Copper technique in breaking chambers
- 1980: First 800 kV breaker
- 1999: Composite insulators
- 1999: Disconnecting Circuit Breakers (DCB)
Global manufacturing network

Our global network of state-of-the-art manufacturing facilities is located close to our customers.

- **Guarulhos, Brazil**
  - EDF 72.5 kV
  - LTB D 145 kV
  - LTB E 345 kV
  - HPL 550 kV

- **10th of Ramadan City, Egypt**
  - EDF 72.5 kV

- **Beijing, China**
  - LTB D 72.5 kV - 170 kV
  - LTB E 245 kV - 420 kV
  - HPL 72.5 kV - 550 kV
  - DCB 72.5 kV - 550 kV

- **Vadodara, India**
  - EDF 72.5 kV
  - LTB D 72.5 - 170 kV
  - LTB E 245 - 800 kV
  - HPL 420 kV

- **Ludvika, Sweden**
  - EDF 36 kV - 72.5 kV
  - LTA 72.5 kV - 145 kV
  - LTB D 72.5 kV - 170 kV
  - LTB E 245 kV - 800 kV
  - DCB 72.5 kV - 550 kV
  - HPL 170 kV - 1100 kV

- **Tangerang, Indonesia**
  - LTB 170 kV

**Timeline**

- **2008**
  - 550 kV without grading capacitors

- **2014**
  - First eco-efficient breaker pilot project based on CO₂ technology
  - EconiQ™ LTA 72.5 kV

- **2016**
  - First 1100 kV breaker
  - EconiQ™ LTA 145 kV

- **2019**
  - Today, more than 200,000 LTB bays installed worldwide
For all types of applications

Live Tank Breakers are widely used globally in different type of applications from traditional use to more specific such as high altitude, very low temperature and for high seismic requirements.
Benefits

- Advanced and proven technology with low energy requirements
- Low environmental impact and life-cycle costs
- High current switching capability
- Compact design and easy installation
- High quality standards and safety
- Global footprint and service organization

Applications

- Transmission lines, transformers, capacitor, reactors and harmonic filters switching
- Renewable power to grid offshore and onshore wind power connections
- Onshore wind power connections
- High altitudes
- Seismic applications – reinforced porcelain, robust support structures and dampers that stand the test of earthquakes
- Low temperature applications
- DC applications
**LTB SF₆ Portfolio**

Hitachi Energy offers a complete portfolio of SF₆ insulated Live Tank Breakers to meet the most stringent requirements in terms of reliability and availability.

### Standard Breakers

#### EDF up to 72.5 kV

Well proven circuit breaker based on Auto-puffer™ technology rated up to 31.5kA of breaking current, design for rapid installation and commissioning.

<table>
<thead>
<tr>
<th>Type</th>
<th>EDF 36-72.5 SK 1-1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated voltage</td>
<td>kV 36-72.5</td>
</tr>
<tr>
<td>Rated continuous current</td>
<td>A 2500</td>
</tr>
<tr>
<td>Rated short-time withstand current</td>
<td>kA 31.5</td>
</tr>
</tbody>
</table>

#### LTB D up to 170 kV

High performance circuit breaker protecting more networks than any other high-voltage breaker.

<table>
<thead>
<tr>
<th>Type</th>
<th>LTB 72.5-170D1/B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated voltage</td>
<td>kV 72.5-170</td>
</tr>
<tr>
<td>Rated continuous current</td>
<td>A 3150</td>
</tr>
<tr>
<td>Rated short-time withstand current</td>
<td>kA 40</td>
</tr>
</tbody>
</table>

#### LTB E up to 800 kV

World’s most versatile transmission breaker for maximum power stability.

<table>
<thead>
<tr>
<th>Type</th>
<th>LTB 170-300 E1</th>
<th>LTB 420 E2</th>
<th>LTB 550 E2</th>
<th>LTB 800 E4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated voltage</td>
<td>kV 170-300</td>
<td>420</td>
<td>550</td>
<td>800</td>
</tr>
<tr>
<td>Rated continuous current</td>
<td>A 4000</td>
<td>4000</td>
<td>4000</td>
<td>4000</td>
</tr>
<tr>
<td>Rated short-time withstand current</td>
<td>kA 50</td>
<td>63</td>
<td>50</td>
<td>50</td>
</tr>
</tbody>
</table>

#### HPL B up to 1100 kV

Maximum capability and highest performance based on puffer interrupters.

<table>
<thead>
<tr>
<th>Type</th>
<th>HPL 170-300 B1</th>
<th>HPL 420-550 B2</th>
<th>HPL 800-1100 B4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated voltage</td>
<td>kV 170-300</td>
<td>420-550</td>
<td>800-1100</td>
</tr>
<tr>
<td>Rated continuous current</td>
<td>A 5000</td>
<td>5000</td>
<td>5000</td>
</tr>
<tr>
<td>Rated short-time withstand current</td>
<td>kA 80</td>
<td>80</td>
<td>80</td>
</tr>
</tbody>
</table>
Series Capacitors By-pass Switch

Used to protect the capacitor bank against overvoltages in a series compensation solution, the by-pass switch will by-pass and insert the series capacitor. A fast acting by-pass switch allows to reduce the dimensions of other protective equipment, improving the overall cost of the installation.

<table>
<thead>
<tr>
<th>Type</th>
<th>LTB 1/170/500 E1</th>
<th>LTB 1/170/500 E1</th>
<th>LTB 1/170/500 E1</th>
<th>LTB 1/170/500 E1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated voltage to earth</td>
<td>550</td>
<td>550</td>
<td>800</td>
<td>1100</td>
</tr>
<tr>
<td>Rated current</td>
<td>A</td>
<td>4000</td>
<td>4000</td>
<td>6300</td>
</tr>
<tr>
<td>By-pass insertion current</td>
<td>A</td>
<td>6800</td>
<td>6800</td>
<td>10000</td>
</tr>
</tbody>
</table>
Econiq™ – Eco-efficient portfolio

Eco-efficient, compact and reliable, Hitachi Energy’s Econiq LTA technology has been helping our customers for years to achieve their sustainability goals.

**Econiq LTA circuit breaker up to 145 kV**

Scalable eco-efficient Live Tank Breaker, combing the reliability and experience from gas-type circuit breakers with the use of carbon dioxide (CO₂) and oxygen (O₂) as an eco-efficient insulation gas mixture.

<table>
<thead>
<tr>
<th>Type</th>
<th>LTA 72.5D1</th>
<th>LTA 145D1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated voltage</td>
<td>kV</td>
<td>72.5</td>
</tr>
<tr>
<td>Rated continuous current</td>
<td>A</td>
<td>2750</td>
</tr>
<tr>
<td>Rated short-time withstand current</td>
<td>kA</td>
<td>31.5</td>
</tr>
<tr>
<td>Gas-mixture</td>
<td></td>
<td>CO₂+O₂</td>
</tr>
</tbody>
</table>

**Econiq DCB LTA circuit breaker up to 72.5 kV**

Scalable eco-efficient Live Tank Breaker, providing both switching and isolation functionality in one compact device.

<table>
<thead>
<tr>
<th>Type</th>
<th>DCB-LTA 72.5D1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated voltage</td>
<td>kWh</td>
</tr>
<tr>
<td>Rated continuous current</td>
<td>A</td>
</tr>
<tr>
<td>Rated short-time withstand current</td>
<td>kA</td>
</tr>
<tr>
<td>Gas-mixture</td>
<td>CO₂+O₂</td>
</tr>
</tbody>
</table>
Switchsync® PWC600 Point-on-wave controller

Switchsync® PWC600 is Hitachi Energy's newest generation of point-on-wave controllers, based on the successful Relion® platform of protection and control products.

Switchsync® PWC600 is designed for single-pole operated circuit breakers, controlling each pole to close and/or open at the point on wave that is optimal for the switching load, the circuit breaker, and power quality. In combination with a suitable Hitachi Energy circuit breaker, it effectively mitigates switching transients to optimize power quality and maximize equipment lifetime.

PWC600 features:
- Automatic optimization of switching targets
- High accuracy through compensation of external parameters and adaptive correction
- Semi-automatic learning of circuit breaker operating time
- Circuit breaker operations monitoring
- Setting wizard for guided entry of application data
- Setting group for maximum application flexibility

Reduce electrical wear and probability of damaging re-ignitions in the circuit breaker.

Prevent nuisance tripping on grid connected equipment due to high inrush currents or grid voltage distortion.

Improve power quality and grid stability.

Significantly reduce contact erosion for generator circuit breakers and in turn optimize life cycle costs.

Prevent exposure of circuit breakers and power equipment excessive switching overvoltages and thereby damage to insulation.
Commitment

We are advancing the world’s energy system to be more sustainable, flexible and secure. As the pioneering technology leader, we collaborate with customers and partners to enable sustainable energy future.

Quality assurance
Hitachi Energy is committed to providing the best products and services. Our products comply with or exceed the latest international standards. In addition to type tests in independent laboratories, our certified design and manufacturing quality assurance process guarantee the highest quality.

Our products are type-tested according to international standards:
• IEC
• ANSI/IEEE
• GOST

Hitachi Energy LTB operating units are certified according to the below standards:
• ISO 900 – Quality
• ISO 14001 – Environment
• ISO 45001 – Occupational health and safety
• ISO 270001 – Information security

Sustainability
We are advancing the world’s energy system to be more sustainable, flexible and secure. As the pioneering technology leader, we collaborate with customers and partners to enable a sustainable energy future – for today’s generations and those to come.

We have placed sustainability at the heart of our purpose and made a promise to advance a sustainable energy future for all.

Sustainability 2030 is our new strategic plan for sustainability, summarizing our key commitments to act and drive business in a sustainable way.

Through Sustainability 2030, we are advancing four key areas:

Planet
Towards carbon-neutral

People
Diversity plus collaboration equals great innovation

Peaceful
Peaceful, inclusive and sustainable societies

Partnership
Foster multi-stakeholder partnerships